DISCLAIMER: This is an example syllabus that is subject to change at faculty discretion.

Course Syllabus

Year/Term

Course Information

CHM-330

Biochemistry I

4 Credit Hours

Academic Calendar:
https://web.doane.edu/sites/default/files/2025-02/25-26%20OLA%20Calendar%202.25_1.pdf

Instructor Information

Name:

Email Address:

Office Hours:

If you need to contact me directly, I prefer that you email me. Please allow 24 hours for me to respond to emails Monday through Friday and 48 hours on the weekend.

Communicating With the Instructor

When questions arise throughout the course, please remember to check the following resources for an answer before reaching out to me:

1. Course Syllabus
2. Announcements
3. The Question Center discussion board

Question Center Discussion

The Question Center Discussion is an excellent place to ask questions and get answers from peers and me. You are encouraged to post your questions here before contacting me unless it is a time-sensitive matter. If you have questions of a personal nature, such as relating to a

personal emergency, questioning a grade on an assignment, or something else that needs to be communicated privately, you are welcome to contact me directly via email or phone.

Technology Help

If you have a question about the technology used in the course, please contact the Doane University Service Center for assistance; their contact information is listed later in the syllabus. If third-party tools are utilized in the course, please contact them directly.

Course Details

Catalog Description

Biochemistry is the study of chemical processes at work in the context of living organisms. Students successfully completing this course will demonstrate an understanding of molecular structure and function of biomolecules, as well as chemical transformation, energetics and basic regulation of central metabolic pathways. In the lab, students will gain experience with common methodologies for investigating proteins.

Course Prerequisites

Must have earned at least a C- in CHM 205, CHM 206 or by permission.

Course Textbook and Materials Will Be Integrated into Your Canvas Portal

Required

Fundamentals of Biochemistry LIFE AT THE MOLECULAR LEVEL, 6th Edition by Voet, Voet and Pratt

ISBN: 978-1-119-90348-2

Course Lab Kits

This course utilizes a lab kit from our educational partner, *Science Interactive*. You will be required to complete both virtual and hands-on lab activities. The Canvas course includes instructions on how to purchase the lab kit.

Learning Objectives and Course Outline

Course Objectives

By the end of the course, you will be able to:

At the completion of this course students will be able to:

1. Characterize and differentiate between the molecular building blocks and how those assemble to create macromolecules or structures (Nucleic acids, proteins, polysaccharides, lipid assembly).
2. Dissect the processes for the breakdown of sugar (glycolysis and the citric acid cycle) and be able to link together how that leads to energy (ATP) production
3. Diagram metabolic pathways, metabolite flow and simple regulation of pathways.
4. Describe how macromolecules function, such as ligand binding to proteins and how enzymes work. Perform calculations to find binding and kinetic parameters.
5. Analyze inhibition and regulation of protein function.

LAB Objectives

Demonstrate hands on biochemical techniques including:

1. Analysis of macromolecules such as amino acids
2. Determination of buffer solutions
3. Enzyme kinetics.
4. DNA extraction

Doane Core Outcomes

These can be found on the Philosophy of the Undergraduate Core at Doane website.

Course Outline

Module	Topic	Assessments & Activities	Aligned Objectives
1	**Chemistry Review, Amino Acids and Protein Structure** **Chapters 1, 2, 3.1-3.2, 3.4, and 4.1-4.3**	A. Review components of biological systems, thermodynamics, and properties of water. B. Analyze the base structure and side chains of all amino acids C. Determine the charge on an amino acid based on pKa.	1, 6, 7

Module	Topic	Assessments & Activities	Aligned Objectives
		D. Compare primary, secondary, tertiary and quaternary structural elements of proteins	
2	**Enzyme structure and function and Control of Enzyme Activity** **Chapters 9.1-9.3 and 10**	A. Evaluate the function of enzymes in biological reactions and the necessity of catalysts B. Contrast K_m, V_{max} and k_{cat} and determine how they relate to enzyme activity C. Relate the Michaelis-Menten and Lineweaver-Burk equations D. Plot a linear graph E. Classify how different types of inhibitors can affect enzymes	1, 4, 5, 6
3	**Heme, Plasma Membranes and Bio signaling** **Chapters 4.4, 5, 7 and 8**	A. Evaluate the basic concept of metabolism and how blood oxygen is controlled B. Compare the structure and function of carbohydrates and lipids C. Analyze the structure and function of plasma membranes D. Examine the process of signal transduction, the role of proteins in the process, and how hormones regulate blood glucose by this process.	1, 4, 6
4	**Glycolysis and Gluconeogenesis** **Chapters 12 and 13**	A. Examine the structural components of the transformation of carbohydrates into energy B. Compare the differences in the reverse process to recreate carbohydrates for storage. C. Discuss the steps needed to prepare your glycolysis product for the citric acid cycle D. Examine the Pentose Phosphate Pathway E. Describe buffer solutions	1,2,3,4,5
5	**Citric Acid Cycle and Oxidative Phosphorylation**	A. Outline the reactants, products, and reactions of the citric acid cycle.	1,2,3,4

Module	Topic	Assessments & Activities	Aligned Objectives
	Chapters 15 and 16	B. Determine how molecules from the electron transport chain can be turned into energy for the cell. C. Dissect the steps of the Pyruvate Dehydrogenase complex. D. Examine the components needed for cellular respiration E. Analyze the mechanism for how a proton graduate can be used to generate ATP F. Describe enzymes	
6	**Glycogen and Lipid Metabolism** **Chapters 14 and 18**	A. Assess the processes of glycogen degradation and synthesis B. Compare the processes of fatty acid degradation and synthesis C. Compare the different possible mechanisms for breakdown of glycogen D. Describe cholesterol metabolism. E. Extract DNA	1,2,3,4
7	**Amino acid biosynthesis, Nucleic Acid Structure and biosynthesis** **Chapters 6, 19 and 21**	A. Assess why certain amino acids are termed “essential” B. Contrast the structure and function of various triglycerides C. Analyze the urea cycle and nucleotide metabolism D. Describe amino acids	1,2,3,6
8	**DNA replication, repair and recombination** **Chapters 22 and 23**	A. Evaluate the basic structures DNA and how RNA is differentiated B. Differentiate DNA Replication, Repair and Recombination C. Label the machinery required to undergo DNA Replication	1,2,3 6

Course Requirements

This is an online course, and there will **not be any face-to-face class sessions**. All communications, submissions of assignments, course interactions, and posting of grades will

utilize Canvas LMS (https://doane.instructure.com). You must have a **reliable internet connection** throughout the course.

Attendance/Participation

Attendance in an online course means logging into Canvas regularly and participating in all the activities posted in the course. In addition, check your Doane University email account regularly, as I may send important information about the course.

Class Preparation

Preparation for class means reading the assigned readings and reviewing all information required for that module. You should plan to work on this course every day. Regular engagement is expected for online courses.

Netiquette Guidelines

At heart, netiquette (etiquette for the Internet) is simple, including good manners and business courtesy. Some of it may seem basic, but some infringements can result in major problems for others or create an unintended insult to another user. The guidelines are adapted from Virginia Shea's *The Core Rules of Netiquette* (1994). Please review the Netiquette Guidelines in the Student Resource Center for more information.

Computer Requirements

To successfully use Canvas, please refer to Doane University's minimum computer requirements. This also includes:

- Reliable computer and internet connection
- A web browser (Chrome or Mozilla Firefox)
- Adobe Acrobat Reader (free)
- Word processing software—Microsoft Word or Google Docs
- Webcam and mic*

*A webcam is optional for privacy purposes during video conferencing and recording.

Drop and Add Dates

If you feel it necessary to withdraw from the course, please contact your advisor for full details on the types of withdrawals available and their procedures.

Federal requirements state that students must complete 75% of the coursework to be eligible to receive an incomplete for the course. Students who fall more than two weeks behind cannot meet this requirement.

Access to Course

You can access the course in Canvas starting from the first day of the course and for 15 days after the term ends. If you need access beyond those 15 days, you must submit a request with a valid reason, which the administration must approve.

Academic Integrity

Fundamental to our mission, core values, and reputation, Doane University adheres to high academic standards. Students of Doane University are expected to conduct themselves in a manner reflecting personal and professional integrity. Disciplinary actions may be taken against students whose academic behavior is not congruent with the expectations of the University. Students are responsible for adhering to the standards detailed in this policy. Not being familiar with these standards does not mean that the students will not be accountable for adherence to them. Additional details on the Academic Integrity policy for violating academic integrity are published in the undergraduate and graduate catalogs. Please review Doane University's Academic Integrity Policy.

Course Grading

Submitting Assignments

Unless otherwise communicated to me, all assignments must be submitted via Canvas. Each assignment will have a designated place to submit your work. All materials, assignments, and deadlines are subject to change without prior notice. You are responsible for staying in touch with me and reviewing the course site, including Announcements, regularly to learn about changes to assignments or due dates.

Grading Scale

Assignment of letter grades is based on a percentage of points earned. The letter grade will correspond with the following percentages achieved. All course requirements must be completed before a grade is assigned.

Grade	Percentage
A+	97-100%
A	93-96%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%

C+	**77-79%**
C	**73-76%**
C-	**70-72%**
D+	**67-69%**
D	**63-66%**
D-	**60-62%**
F	**<60%**

Module Schedule/Grading Scheme

Homework Assignments - (**12%** of total grade) Chapter homework sets will be assigned through WileyPlus (multiple choice, fill-in the blank, drawing and molecular visualization) based on the information covered in the assigned chapters, lecture videos and worksheets. The knowledge assessed in the homework assignments is application, analysis, and understanding. These assignments are meant to serve as practice opportunities for examinations. Each student will have 3 chances to answer each question.

Chapter Quizzes- (**8%** of total grade) Chapter quizzes are a series of questions through WileyPlus (mostly true/false, and some multiple choice or fill-in the blank) based on the knowledge covered in the assigned chapters. The information assessed in the quizzes is knowledge and understanding. This is meant to serve as a practice opportunity to test your knowledge of the individual chapters as well as an incentive to read each chapter. Because quizzes are primarily true/false, each student will have 1 chance to answer each question. By the end of this assignment, all chapters for the week should be read.

Basic Concepts Worksheets- (**5%** of total grade) The basic concept worksheet will guide the student through the introductory level information for each module. Worksheets will consist of drawing structures, graphs or metabolic pathways (in pencil) to give students both hands-on experience in drawing biochemical structures as well as serve personal notes which the student can refer directly back to. Students will be expected to print out each worksheet and either scan or take a photo of their finished product and email it to the instructor.

Exams: Proctored by Third Party Provider - (**45%** of total grade) Exams will cover concepts from the assigned readings, homework and labs, usually stressing ideas from the basic knowledge worksheet. They will consist of 30-40 questions. There will be a mix of basic concepts and deeper thinking questions. You will need to go through the Third Party Provider tutorial in the course to learn how to have your exam proctored by the online software. Your last unit exam serve as both a unit exam and comprehensive final.

Lab - (**20%** of total grade) Both online and wet labs (through Science Interactive) will be assigned. Online labs are designed to be a fun way to observe the concepts taught within the chapters. There will be four wet labs, which will provide "hands-on" opportunities to engage with course concepts. In modules 2-8, there will be a different lab - either wet, online or both - assigned as well as a series of

questions following the lab.

Advanced Concepts Presentation (**10%** of total grade) These presentations are designed to allow students the opportunity to take on the role of the instructor. Each presentation will be around 5-10 minutes and use information from the chapter and in some cases, real-world applications. If needed, supplementary materials (i.e. journal articles) that show examples of the concepts will be included. Students will be expected to record videos of themselves talking through the material covered in the assignment. Feel free to use PowerPoint or any other means to convey your point.

Tutor Me

Students can access a **free online tutoring service** within their Canvas account. You can connect with a live free tutor or submit a paper to get feedback before submitting.

Proctored Assessments

This course **may contain proctored quizzes and exams, which are not optional**. For these proctored events, Doane uses YuJa Verity, a secure, online proctoring service that allows you to complete your exam from any chosen location at any time. Proctoring assures your instructor that any suspicious activity by test takers will be monitored and reported. The cost of the proctoring is included in the tuition and fees for this course.

Late or Missed Assignments (at the discretion of the faculty member)

All assignments must be completed and turned in to finish the course. Furthermore, all assessment types (assignments, discussions, labs, quizzes, final exam) must be submitted by the due date to receive credit. Unless you discuss an extension with me before the due date, late submissions will receive zero points.

Assignment & Assessment Feedback

Please allow 1-3 days for feedback on assignments. Be sure to review all of my feedback, as this will help you reflect on what you have learned while receiving suggestions for improvement.

Grade Appeals

Students who believe that their grade was miscalculated due to a mathematical error should contact the instructor within **ten (10) days of the grade posting**. Students are encouraged to talk with their advisor to offer an assessment of the concern and clarify the steps of the appeal process. More information is published in the Undergraduate and Graduate Catalogs.

Support and Services

Technical Support

If you need technical assistance, please access the Self-Service Portal. The help desk can be reached at 402-826-8411 or by email at helpdesk@doane.edu.

Accessibility Statement

In compliance with the Rehabilitation Act of 1973, Section 504, and the Americans with Disabilities Act of 1990, professional disability specialists and support staff at Doane University facilitate a comprehensive range of academic support services and accommodations for qualified students with disabilities. Doane University staff coordinate student transitions from high schools and community colleges, conduct in-service training for faculty and staff, enable the resolution of accessibility issues, conduct community outreach, and facilitate collaboration among Doane University staff on disability policies, procedures, and accommodations.

Accommodations & Disability Services

Doane University's Disability Services Office will guide accommodations and universal access. To request accommodation, please complete the Self-Identification Form and visit the website for additional information as soon as possible.

Academic Support

Doane University offers all of its students access to Academic Support services.

Title IX Requirements: Mandatory Reporting

At Doane, all university employees, including faculty, are considered Mandatory Reporters. As a Mandatory Reporter, I am required to report incidents of sexual misconduct and relationship violence to the Title IX Coordinator and, thus, cannot guarantee confidentiality. This means that if you tell me about an incident of sexual harassment, sexual assault, domestic violence, dating violence, stalking, and/or other forms of prohibited discrimination, I have to share the information with the University's Title IX Coordinator. My report does not mean that you are officially reporting the incident. This process is in place to ensure you have access to and are able to receive the support and resources you need. Please visit the Campus Advocacy, Prevention, and Education (CAPE) Project for additional information, including confidential resources.

Anti-Harassment Policy

Doane University, referred to as the "University," is committed to providing all University community members with a safe and non-discriminatory learning, living, and working environment. This policy addresses the University's responsibilities under Title IX, the Violence Against Women Reauthorization Act of 2013, and the Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act ("Clery Act"). More information is published in the Student Handbooks.

Instructional Technology Accessibility and Privacy Policies

Technology accessibility and privacy policies are available on the Student Resource Center within the Canvas LMS.

Regular and Substantive Interaction

The U.S. Department of Education mandates that online courses include "regular and substantive interaction" (RSI) between students and instructors to be considered distance education. This course adheres to the RSI expected of all distance education courses. The course adheres to the regular component through

- a clear schedule of due dates for lessons, readings, and assessments
- an instructor of record who monitors student progress in the course and alerts the students who are not engaging adequately in the course.

The substantive interaction is achieved through

- assessment of students' work with feedback on a scheduled basis
- an active discussion board about course content monitored by the instructor
- providing information about the course content on a regular basis or in response to questions.

Syllabus Addendum & Disclaimer

I (the instructor) view the course syllabus as an educational contract between myself and each student. Every effort will be made to avoid changing the course schedule, but unforeseen events may make syllabus changes necessary. I reserve the right to make changes to the syllabus as deemed necessary. Students will be notified promptly of any syllabus changes via email or course site announcements. Please check your Doane University email and the course site announcements often.

Syllabus Changes

The instructor and Doane University reserve the right to change this course syllabus. All students will be notified of any changes.

Syllabus Addendum

Each student is responsible for knowing the policies, resources, and expectations specified in the Doane Syllabus Addendum.